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# TFT LCD Tentative Specification

# MODEL NO.: M150X5 –L01

Customer :_____

Approved by : _____

Note :

| Liquid Crystal Display Division | | |
|---|---|---|
| QRA Dept. | TDD I Dept. | PDD I Dept. |
| Approval | Approval | Approval |
| 陳 92.5.22 永一 | 李汪洋 92.5.26 | 林 92.5.22 慈仁 |



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## REVISION HISTORY

| Version | Date | Page (New) | Section | Description |
|---|---|---|---|---|
| Ver 0.0 | May.05,'2003 | All | All | Tentative Specification was first issued. |



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| Version | Date | Page (New) | Section | Description |
|---|---|---|---|---|
| | | | | |

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# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

M150X5-L01 is a 15.0" TFT Liquid Crystal Display module with 2 CCFL Backlight units and 20 pins LVDS interface. This module supports 1024 x 768 XGA mode and can display 16.2M colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

The PSWG is to establish a set of displays with standard mechanical dimensions and select electrical interface requirements for an industry standard 15.0" XGA LCD panel ; to enable both LCD monitor makers and panel suppliers to better manage volatile LCD supply and demand.

## 1.2 FEATURES

- XGA (1024 x 768 pixels) resolution
- DE(Data Enable) only mode
- LVDS Interface with 1pixel/clock
- PSWG (Panel Standardization Working Group)

## 1.3 APPLICATION

- Desktop monitors

## 1.4 GENERAL SPECIFICATI0NS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 304.128(H) x 228.096(V) (15.0" diagonal) | mm | (1) |
| Bezel Opening Area | 307.4(H) x 231.3(V) | mm | |
| Driver Element | a-Si TFT active matrix | - | - |
| Pixel Number | 1024 x R.G.B. x 768 | pixel | - |
| Pixel Pitch | 0.297(H) x 0.297(W) | mm | - |
| Pixel Arrangement | RGB vertical stripe | - | - |
| Display Colors | 16,194,277 | color | - |
| Transmissive Mode | Normally white | - | - |
| Surface Treatment | Hard coating ( 3H ) , Anti-glare ( Haze 25 ) | - | - |

## 1.5 MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal(H) | 326.0 | 326.5 | 327.0 | mm | (1) |
| | Vertical(V) | 253.0 | 253.5 | 254.0 | mm | |
| | Depth(D) | - | 11.0 | 11.5 | mm | (1)(2) |
| Weight | | - | - | 1200 | g | - |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) The depth is without connector.



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## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

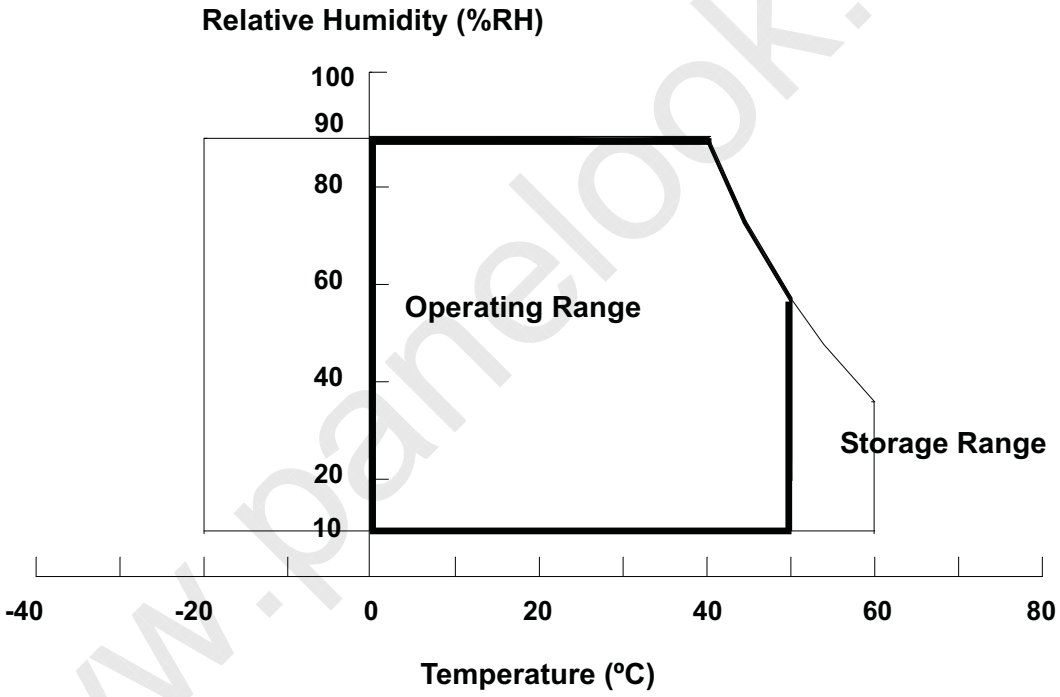
| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | +50 | ºC | (1), (2) |
| Storage Humidity | $H_{ST}$ | 10 | 90 | % | - |
| Operation Humidity | $H_{OP}$ | 10 | 90 | % | - |
| Shock (Non-Operating) | $S_{NOP}$ | - | 50 | G | (3), (5) |
| Vibration (Non-Operating) | $V_{NOP}$ | - | 1.5 | G | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≤ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation of water.




Note (2) The temperature of panel surface should be 0 ºC Min. and 60 ºC Max.

Note (3) 11ms, 1 time each ±X,±Y and ±Z directions

Note (4) 10 ~ 500 Hz, 30 min./1 cycle , 1.5mm max, 30 min. each X, Y and Z directions

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

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## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | $V_{DD}$ | -0.3 | 4.0 | V | |

### 2.2.2 BACKLIGHT UNIT

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Lamp Voltage | $V_L$ | - | 2.5K | $V_{RMS}$ | (1), (2), $I_L$ = 8 mA |
| Lamp Current | $I_L$ | - | 8.5 | $mA_{RMS}$ | (1), (2) |
| Lamp Frequency | $F_L$ | - | 80 | KHz | |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to Section 3.2 for further information).

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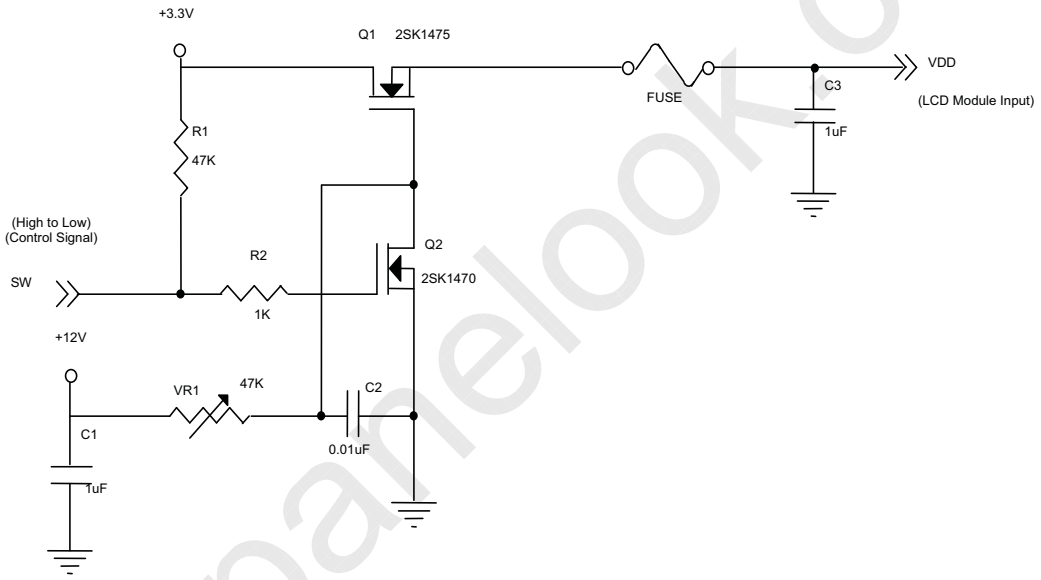
## 3. ELECTRICAL CHARACTERISTICS

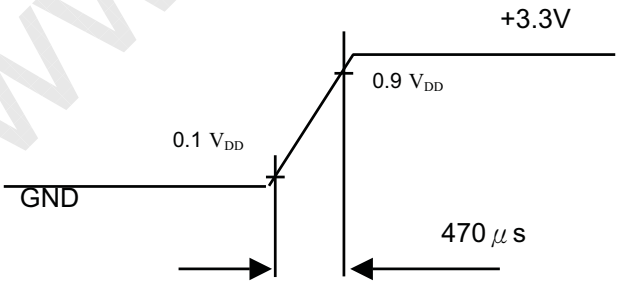
### 3.1 TFT LCD MODULE(1)

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | - |
| Ripple Voltage | | $V_{RP}$ | - | - | 100 | mVp-p | |
| Rush Current | | $I_{RUSH}$ | - | - | (2.0) | A | (2) |
| Power Supply Current | White | Icc | - | (500) | | mA | (3)a |
| | Black | | - | (800) | | mA | (3)b |
| Differential Input Voltage for LVDS Receiver Threshold | "H" Level | $V_{IH}$ | - | - | 100 | mV | - |
| | "L" Level | $V_{IL}$ | -100 | - | - | mV | - |
| Terminating Resistor | | $R_T$ | - | 100 | - | Ohm | - |

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:

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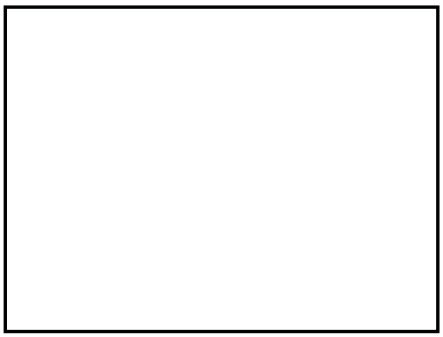
Note (3) The specified power supply current is under the conditions at $V_{DD}$ =3.3V, Ta = 25 ± 2 ºC, DC Current and $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

Active Area

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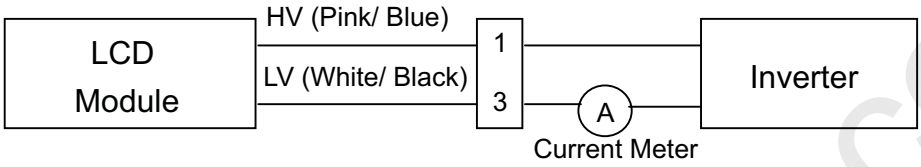
3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Lamp Input Voltage | $V_L$ | TBD | TBD | TBD | $V_{RMS}$ | $I_L$ = 8.0 mA |
| Lamp Current | $I_L$ | 3.0 | 8.0 | 8.5 | $mA_{RMS}$ | (1) |
| Lamp Turn On Voltage | $V_S$ | - | - | TBD (25 °C) | $V_{RMS}$ | (2) |
| | | - | - | TBD (0 °C) | $V_{RMS}$ | (2) |
| Operating Frequency | $F_L$ | 40 | 55 | 80 | KHz | (3) |
| Lamp Life Time | $L_{BL}$ | TBD | | - | Hrs | (5) |
| Power Consumption | $P_L$ | - | TBD | - | W | (4), $I_L$ = 8.0 mA |

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:




Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may generate interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and $I_L$ =8.0$mA_{RMS}$ until one of the following events occurs:

(a) When the brightness becomes ≤ 50% of its original value.

(b) When the effective ignition length becomes ≤ 80% of its original value. (Effective ignition length is defined as an area that the brightness is less than 70% compared to the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid generating too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.



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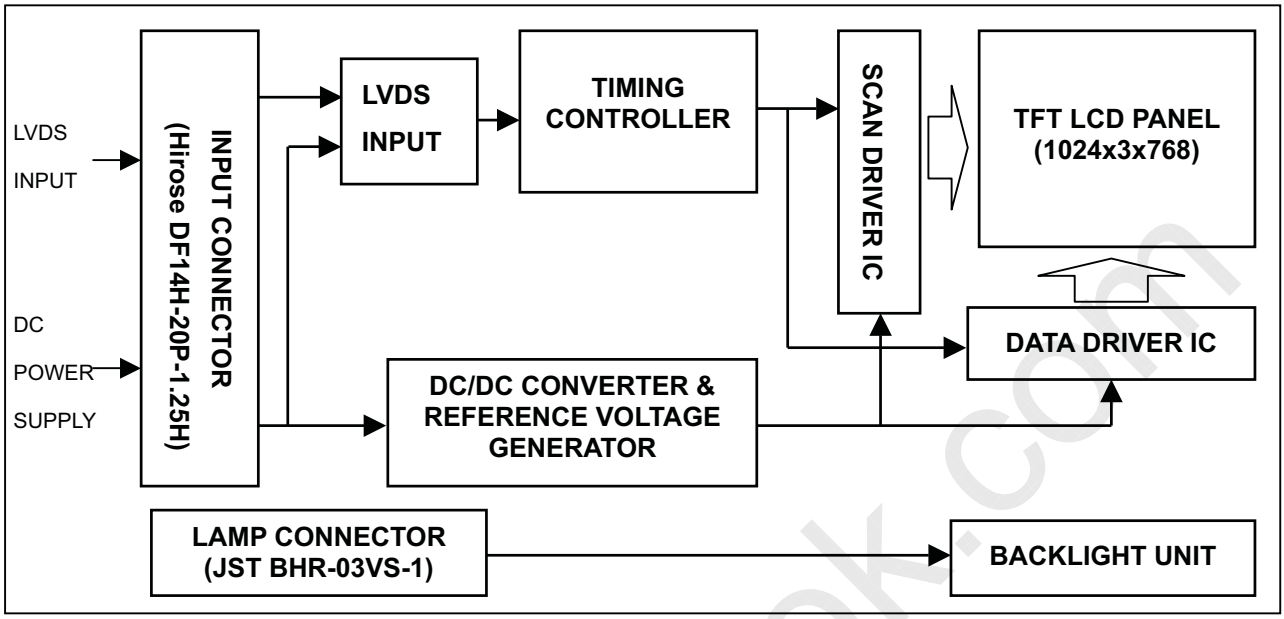
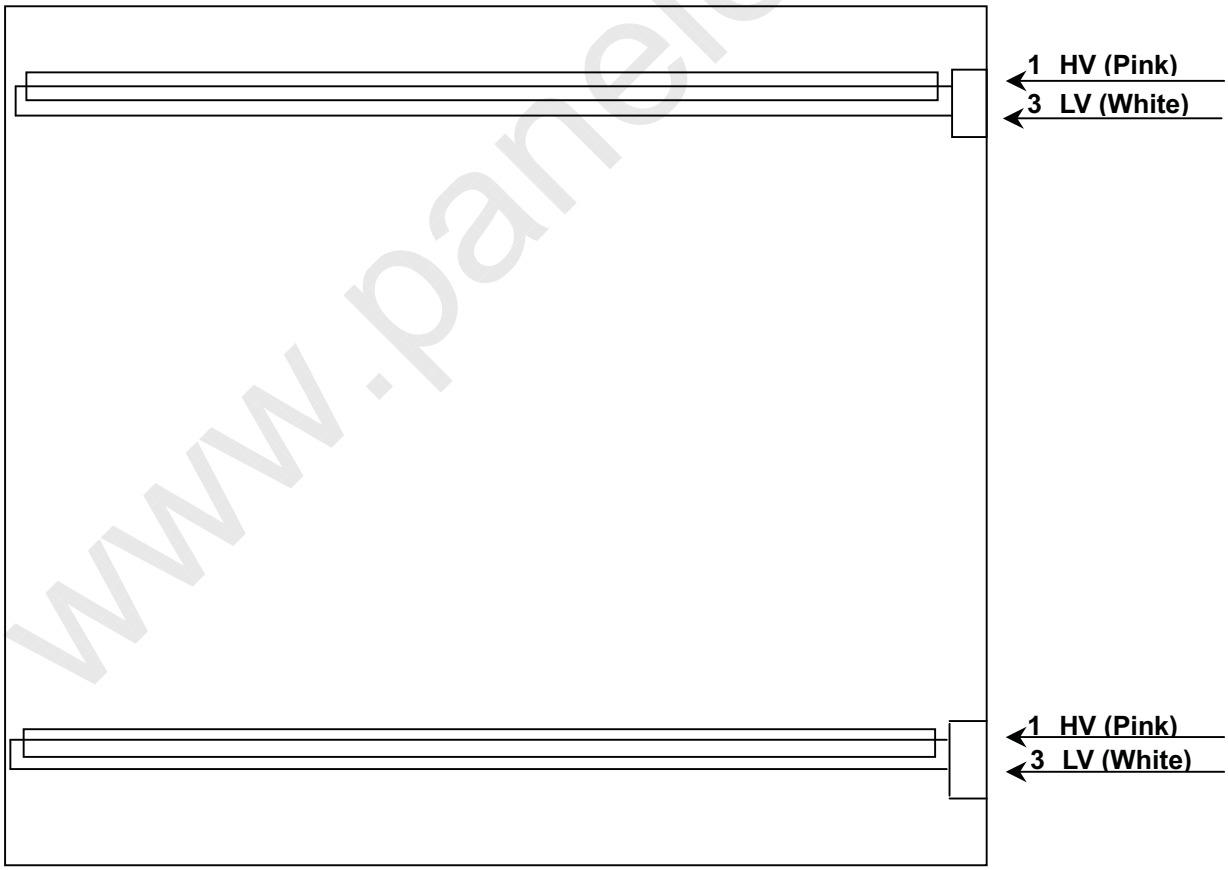
## 4. BLOCK DIAGRAM

### 4.1 TFT LCD MODULE




### 4.2 BACKLIGHT UNIT

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## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD MODULE

| Pin No. | Symbol | Function | Polarity | Note |
|---|---|---|---|---|
| 1 | VDD | Power Supply +3.3V(typical) | | |
| 2 | VDD | Power Supply +3.3V(typical) | | |
| 3 | GND | Ground | | |
| 4 | GND | Ground | | |
| 5 | RX0- | LVDS Differential Data Input | Negative | |
| 6 | RX0+ | LVDS Differential Data Input | Positive | |
| 7 | GND | Ground | | |
| 8 | RX1- | LVDS Differential Data Input | Negative | |
| 9 | RX1+ | LVDS Differential Data Input | Positive | |
| 10 | GND | Ground | | |
| 11 | RX2- | LVDS Differential Data Input | Negative | |
| 12 | RX2+ | LVDS Differential Data Input | Positive | |
| 13 | GND | Ground | | |
| 14 | RXCLK- | LVDS Differential Data Input | Negative | |
| 15 | RXCLK+ | LVDS Differential Data Input | Positive | |
| 16 | GND | Ground | | |
| 17 | RX3- | LVDS Differential Data Input | Negative | |
| 18 | RX3+ | LVDS Differential Data Input | Positive | |
| 19 | GND | Ground | | |
| 20 | NC | tied to ground | | |

(1)Connector Part No.: [Hirose] DF14H-20P-1.25H

(2)Matching socket Part No.: [Hirose] DF14-20S-1.25C

### 5.2 BACKLIGHT UNIT

| Pin | Symbol | Description | Color |
|---|---|---|---|
| 1 | HV | High Voltage | Pink/ Blue |
| 3 | LV | Ground | White/ Black |

Note (1) Connector Part No.: BHR-03VS-1 (JST) or equivalent

Note (2) Matching Connector Part No.: SM02B-BHS-1-TB (JST) or equivalent

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## 5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | R7 | R6 | G5 | G4 | G3 | G2 | G1 | G0 | R7 | R6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(252) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(252) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(252) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(252) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(252) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(252) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(252) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(252) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(252) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

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# 6. INTERFACE TIMING

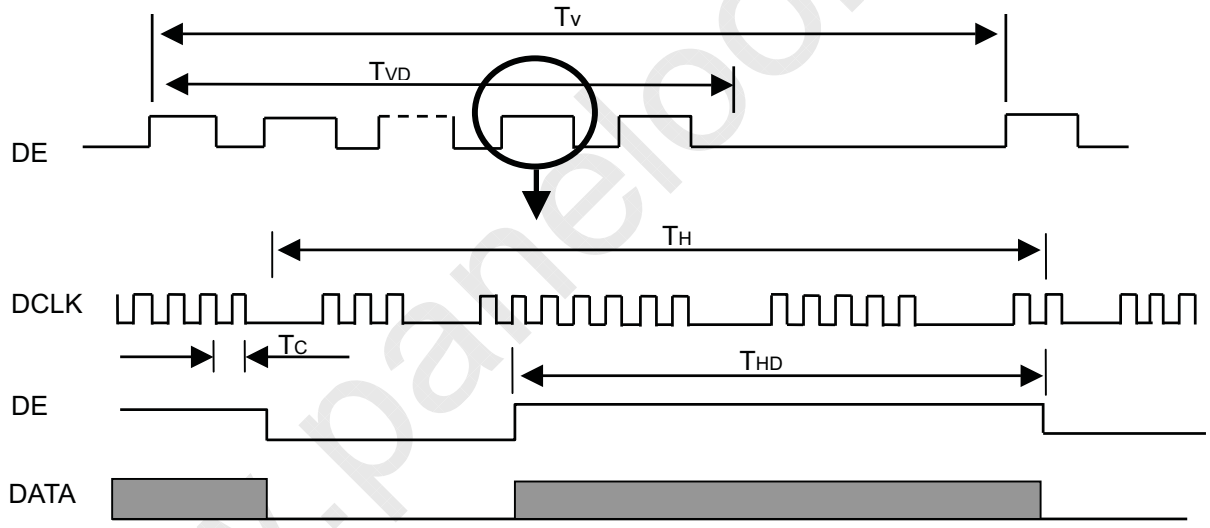
## 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| DCLK | Pixel Clock | $1/T_C$ | - | 65 | 80 | MHz | - |
| DE | Vertical Total Time | $T_V$ | (780) | 806 | (1200) | $T_H$ | - |
| | Vertical Address Time | $T_{VD}$ | 768 | 768 | 768 | $T_H$ | - |
| | Horizontal Total Time | $T_H$ | (1140) | 1344 | (1600) | $T_C$ | - |
| | Horizontal Address Time | $T_{HD}$ | 1024 | 1024 | 1024 | $T_C$ | - |

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

**INPUT SIGNAL TIMING DIAGRAM**

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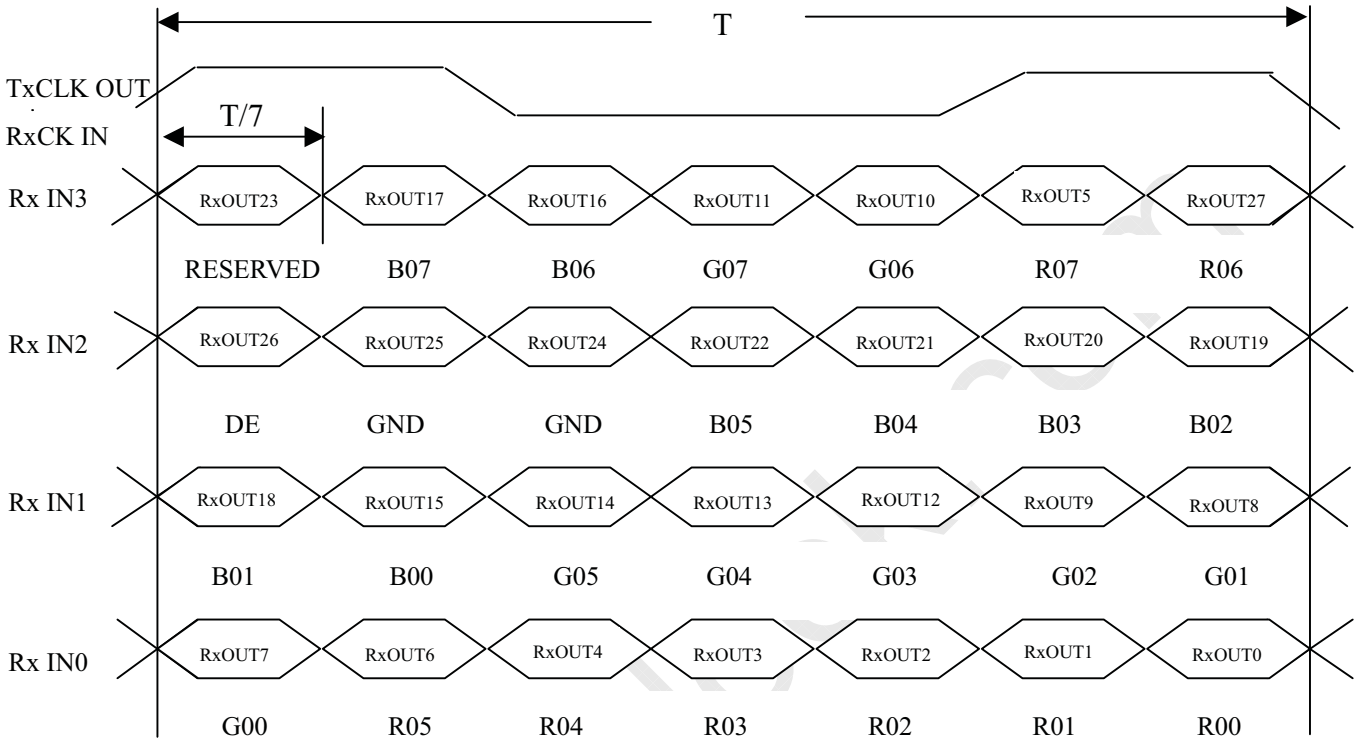
## TIMING DIAGRAM of LVDS



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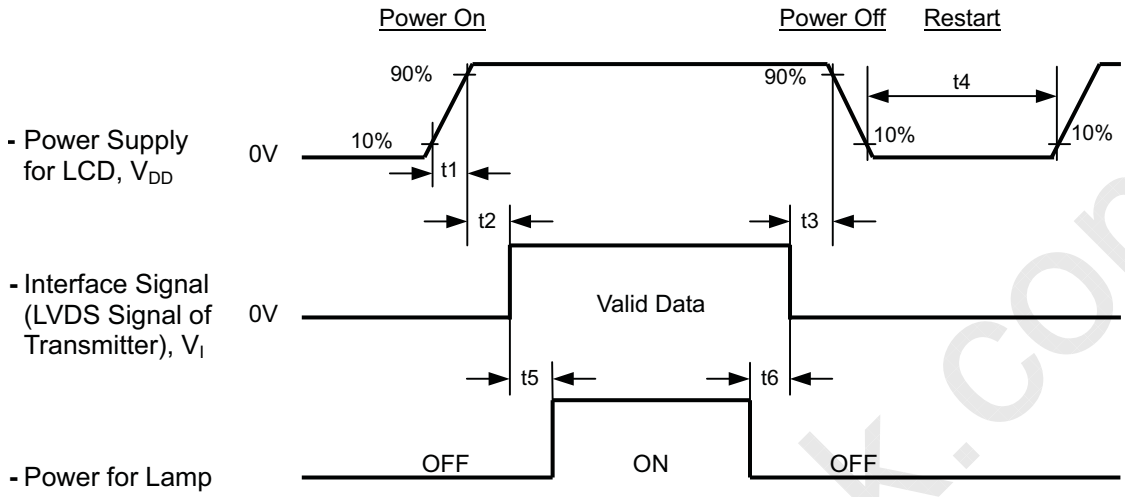
## 6.2 POWER ON/OFF SEQUENCE




Timing Specifications:

0 < t1 ≦ 10 msec

0 < t2 ≦ 50 msec

0 < t3 ≦ 50 msec

t4 ≧ 1 sec

t5 ≧ 100 msec

t6 ≧ 100 msec

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD $V_{DD}$ to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

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# 7. OPTICAL CHARACTERISTICS

## 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | °C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | $V_{DD}$ | 3.3 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| Inverter Current | $I_L$ | 8.0 | mA |

The measurement methods of optical characteristics are shown in Section 7.2. The following items should be measured under the test conditions described in Section 7.1 and stable environment shown in Note (4).

## 7.2 OPTICAL SPECIFICATIONS

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | $\theta_x$=0°, $\theta_Y$ =0° Viewing Normal Angle | 200 | 350 | - | - | (2), (4) |
| Response Time | | $T_R$ | | - | 5 | TBD | ms | (3) |
| | | $T_F$ | | - | 11 | TBD | ms | |
| Luminance of White (Center point) | | L | | 150 | 200 | - | cd/m$^2$ | (4),(5) |
| White Variation | | δW | | - | TBD | TBD | - | (4),(5) |
| Color Chromaticity | Red | Rx | | - | TBD | - | - | (1), (4) |
| | | Ry | | - | TBD | - | - | |
| | Green | Gx | | - | TBD | - | - | |
| | | Gy | | - | TBD | - | - | |
| | Blue | Bx | | - | TBD | - | - | |
| | | By | | - | TBD | - | - | |
| | White | Wx | | 0.283 | 0.313 | 0.343 | - | |
| | | Wy | | 0.299 | 0.329 | 0.359 | - | |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥10 | 50 | 60 | - | Deg. | |
| | | $\theta_x$- | | 50 | 60 | - | | |
| | Vertical | $\theta_Y$+ | | 30 | 40 | - | | |
| | | $\theta_Y$- | | 50 | 60 | - | | |

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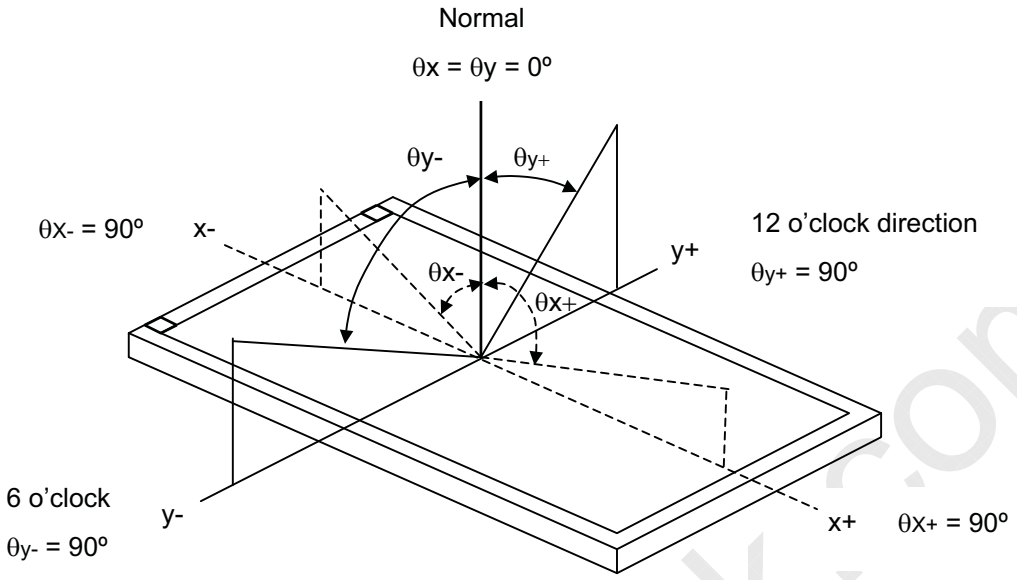
Note (1) Definition of Viewing Angle (θx, θy):




Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

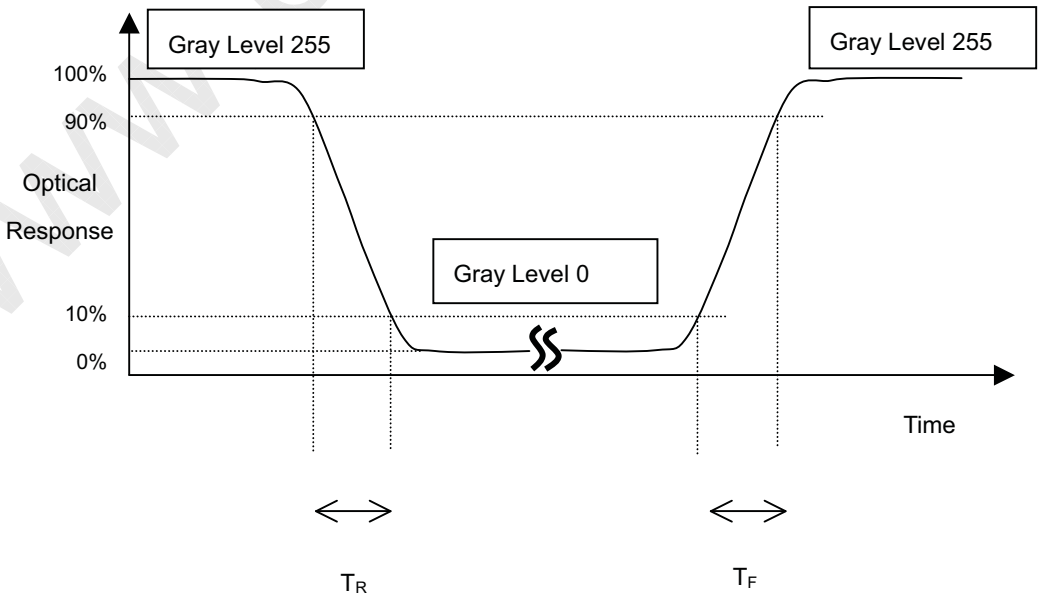
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (3) Definition of Response Time ($T_R$, $T_F$):



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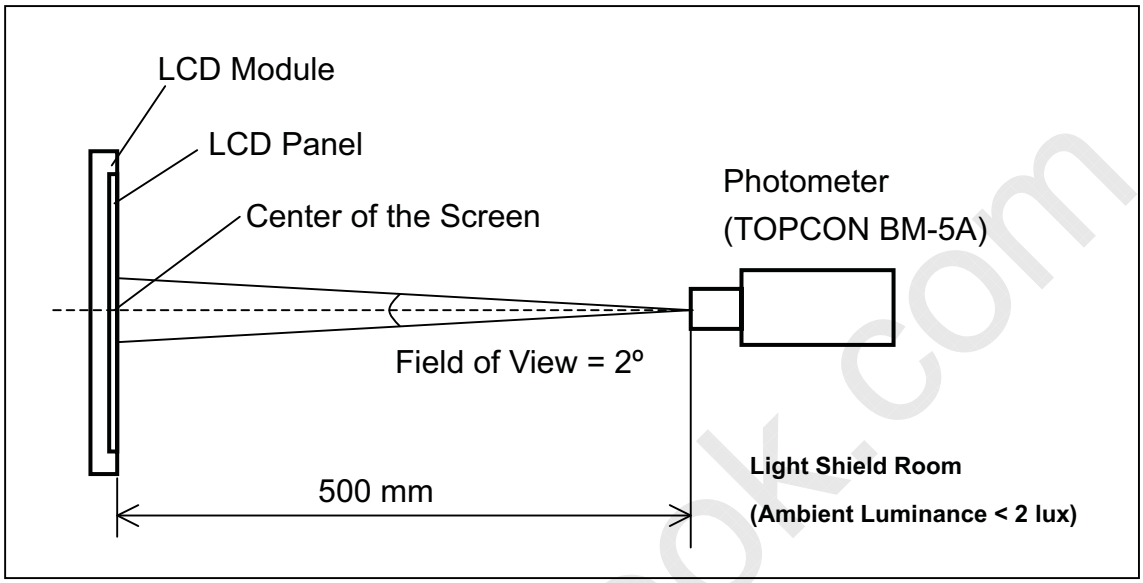
Note (4) Measurement Setup:

The LCD module should be stabilized at given temperature for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 15 minutes in a windless room



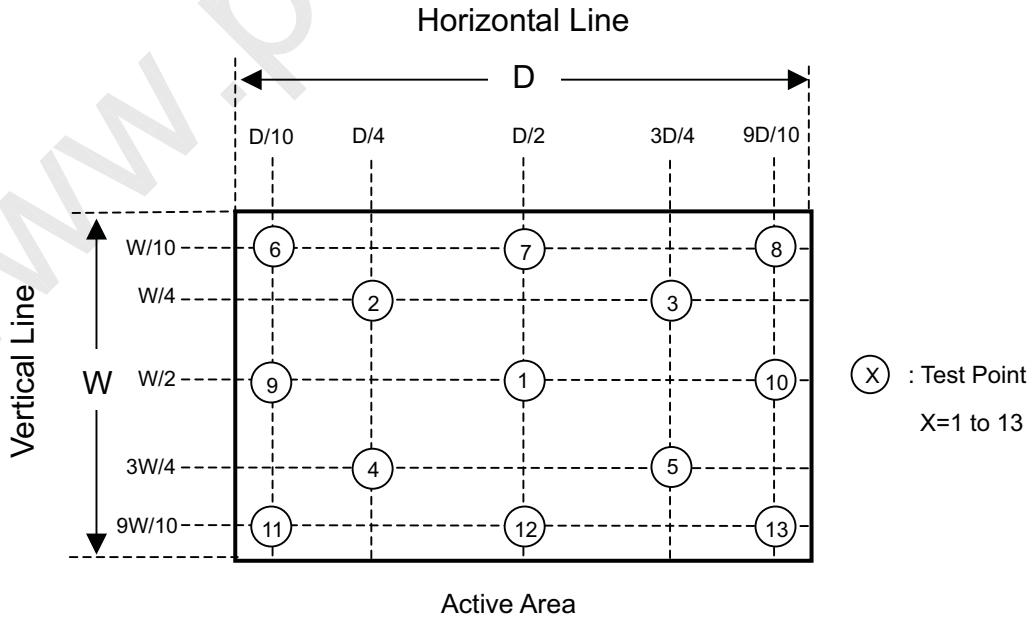

Note (5) Definition of luminance measured points:

Measure the luminance of gray level 255 at point L(1)

Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

$$\delta W = \frac{\text{Maximum [L (1), L (6), L (7), L (8), L (9), L (10), L (11), L (12), L (13)]}}{\text{Minimum [L (1), L (6), L (7), L (8), L (9), L (10), L (11), L (12), L (13)]}}$$

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# 8. PRECAUTIONS

## 8.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the lamp wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

## 8.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

## 8.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.



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# 9. PACKAGING

## 9.1 PACKING SPECIFICATIONS

(1) 10 LCD modules / 1 Box

(2) Box dimensions : 511(L) X 420(W) X 360(H) mm

(3) Weight : approximately 11Kg ( 10 modules per box)

## 9.2 PACKING Method

Figures 9-1and 9-2 are the packing method.

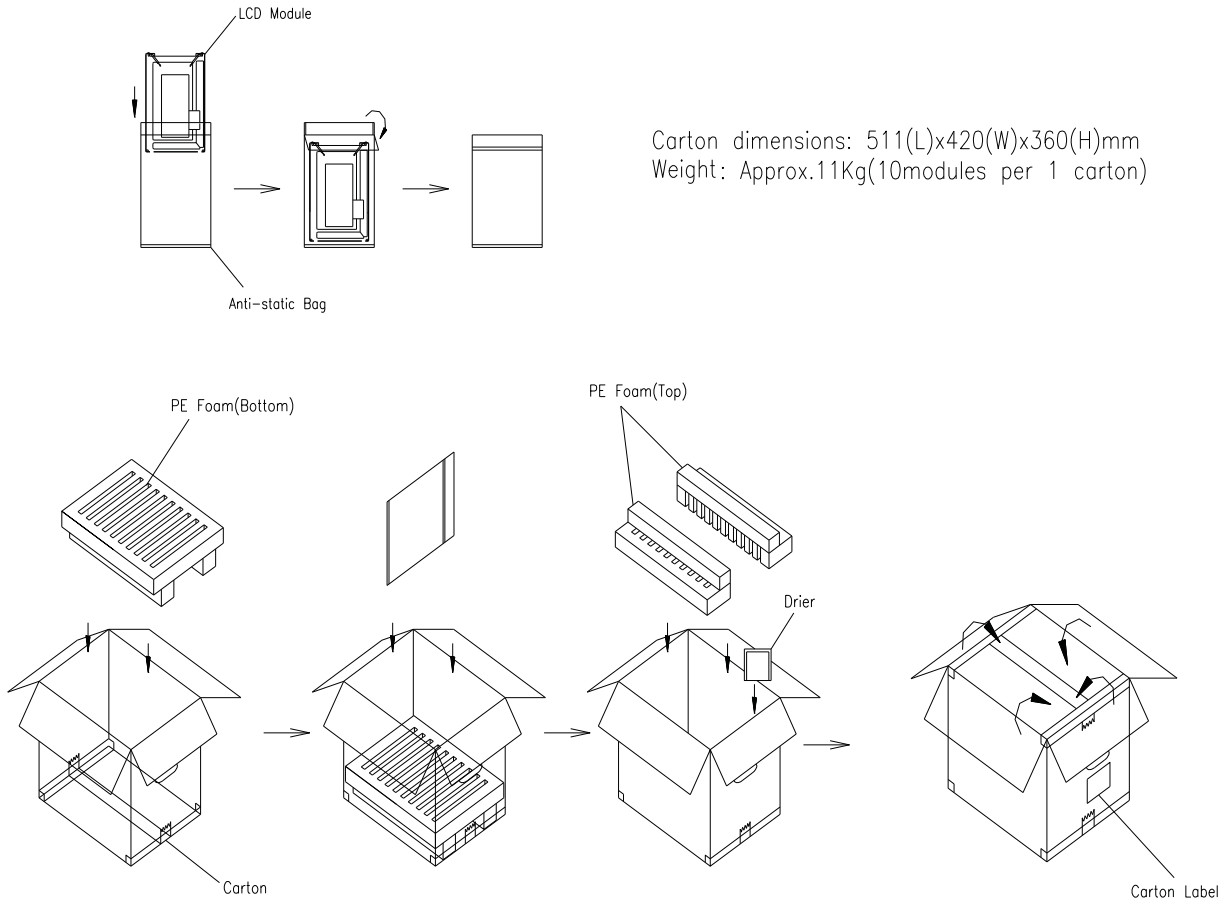


Figure. 9-1 Packing method



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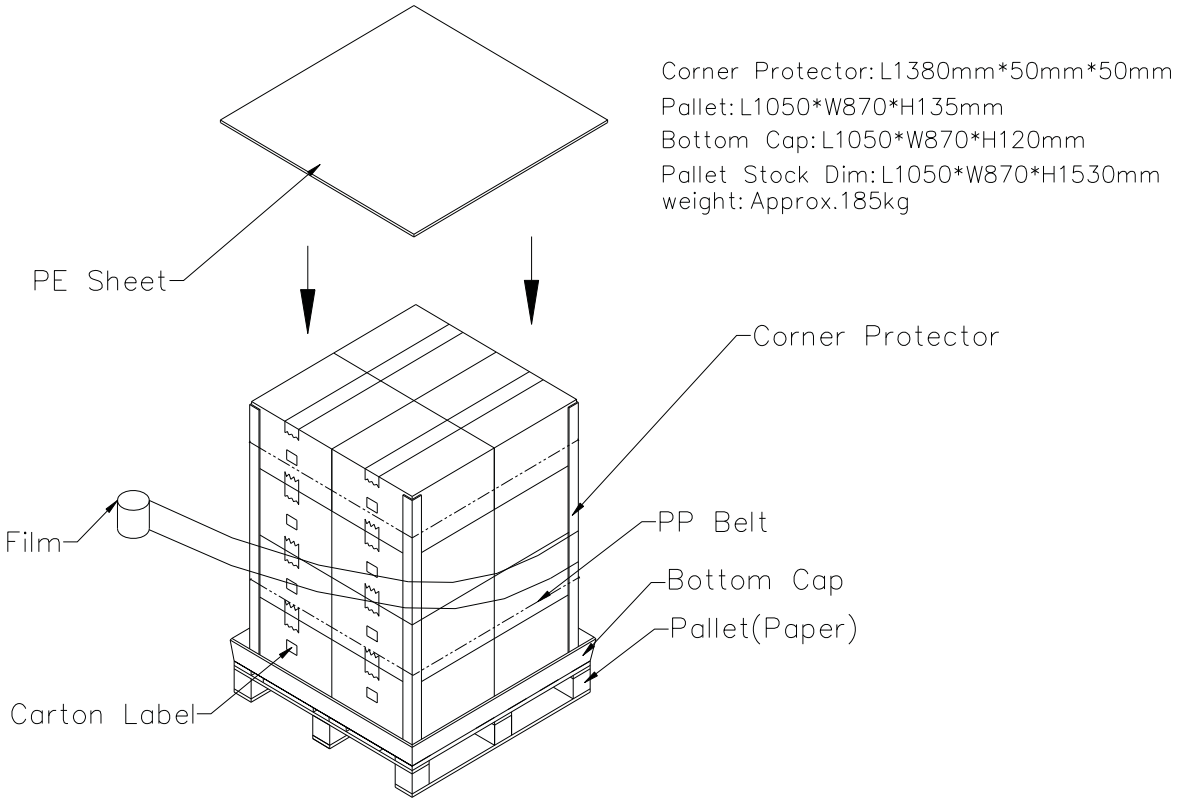


Figure. 9-2 Packing method



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## 10. INCOMING INSPECTION DAY

The Supplier should be acquainted the inspection results (acceptance or rejection) by Customer, and the results are in accordance with the incoming inspection standard within 30 days after the date of the bills of lading. Should Customer fail to so notify the Supplier within the said 30 days period. The Customer's right to reject the LCMS shall then lapse, and the said LCMS shall be deemed to have been accepted by the customer.

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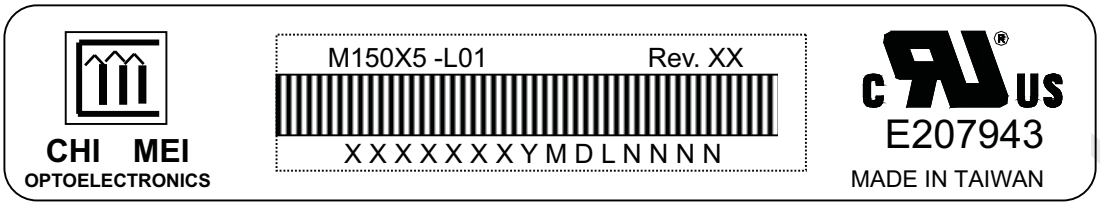
# 11. DEFINITION OF LABELS

## 11.1 CMO MODULE LABEL

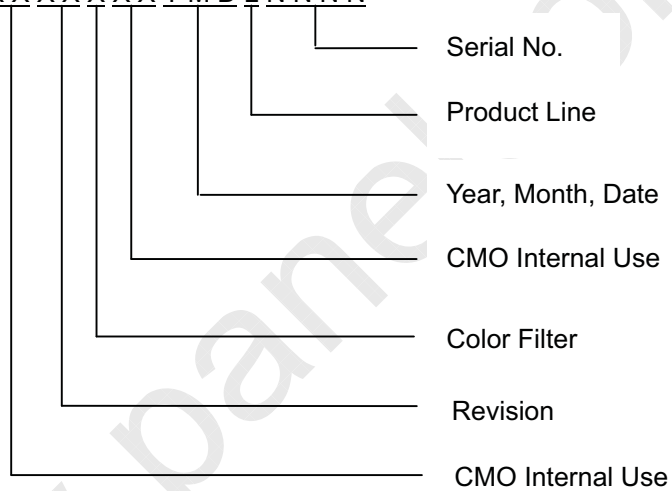
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.




(a) Model Name: M150X5 –L01

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X X Y M D L N N N N




Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2000~2009
Month: 1~9, A~C, for Jan. ~ Dec.
Day: 1~9, A~Y, for 1st to 31st, exclude I and O

(b) Revision Code: cover all the change

(c) Color Filter: 0 ->CMO, 2 -> Toppan

(d) Serial No.: Manufacturing sequence of product

(e) Product Line: 1 -> Line1, 2 -> Line 2, …etc.



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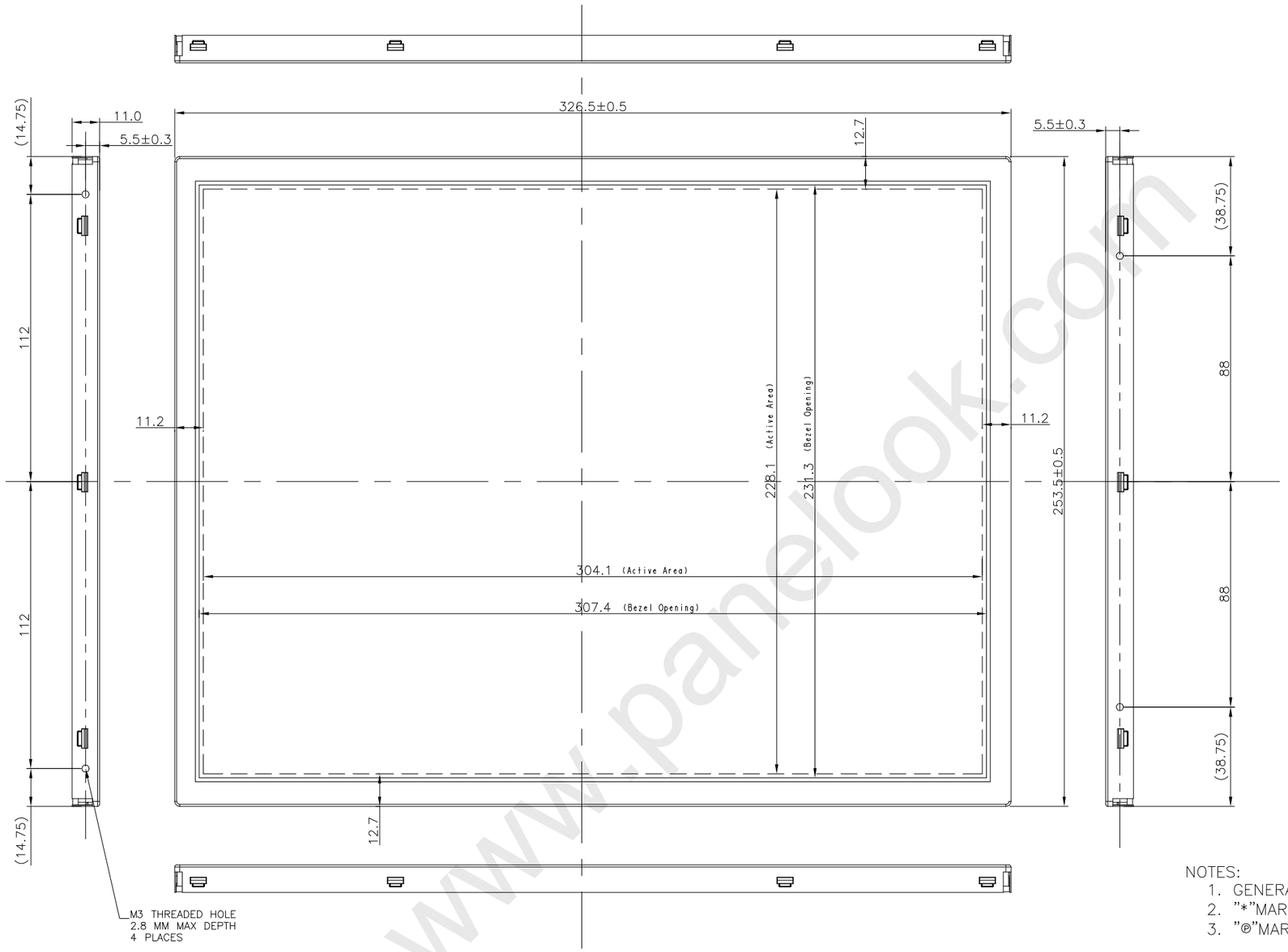


NOTES:
1. GENERAL TOLERANCE: ±0.5
2. "*"MARKS THE DESIGN CRITICAL DIMENSION
3. "℗"MARKS THE PROCESS CRITICAL DIMENSION

| MARK | DESCRIPTION | DATE | CHANGE BY | APPROVAL BY | ECN NO. |
|---|---|---|---|---|---|
| | | | | | |

**CHI MEI** OPTOELECTRONICS CORP. 奇美電子股份有限公司

| | | | | | |
|---|---|---|---|---|---|
| APPROVED: DAVIS WANG | DWG NO.: M150541011 | | | | |
| CHECKED: JEMMY CHANG | DATE: 15/May/2003 | | | | |
| DESIGNER: CHANEY CHEN | PART NO.: | | | | |
| DRAWER: CHANEY CHEN | REV.: 1 | UNIT: | SCALE: | SHEET: | |
| TITLE: Outline M150X5-L01 | | MM | 1:1 | 1/2 | |

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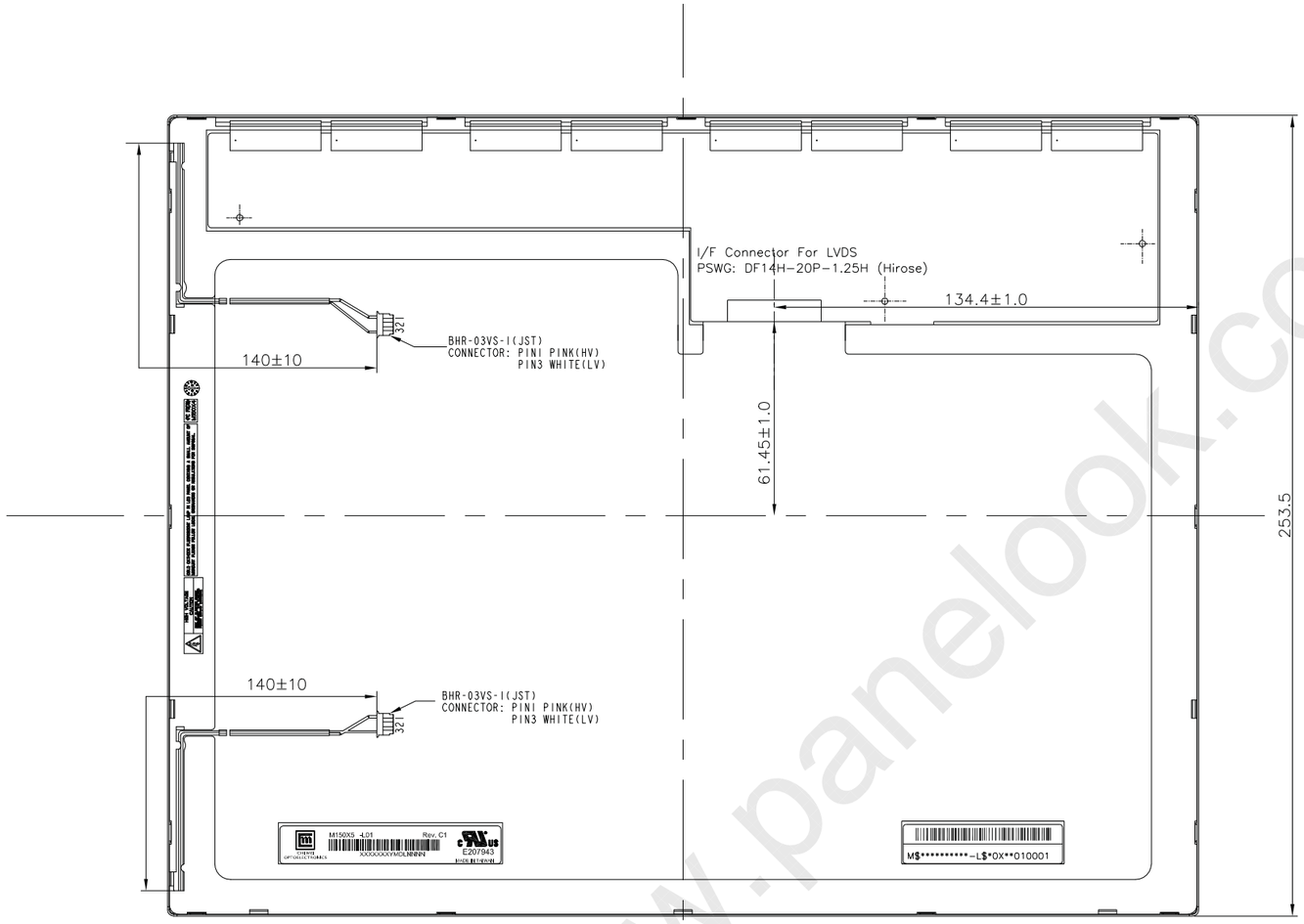


NOTES:
1. GENERAL TOLERANCE: ±0.5
2. "*"MARKS THE DESIGN CRITICAL DIMENSION
3. "®"MARKS THE PROCESS CRITICAL DIMENSION

| MARK | DESCRIPTION | DATE | CHANGE BY | APPROVAL BY | ECN NO. |
|---|---|---|---|---|---|
| | | | | | |

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| | | | | | |
|---|---|---|---|---|---|
| APPROVED: DAVIS WANG | DWG NO.: M150541011 | | | | |
| CHECKED: JEMMY CHANG | DATE: 15/May/2003 | | | | |
| DESIGNER: CHANEY CHEN | PART NO.: | | | | |
| DRAWER: CHANEY CHEN | REV.: 1 | UNIT: | SCALE: | SHEET: | |
| TITLE: Outline M150X5-L01 | | MM | 1:1 | 2/2 | |

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